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(54) IMPROVEMENTS IN OR RELATING TO TILTING CHAIRS

(71) We, HALLAM POLYMERS & ENGINEERING LIMITED, a British Company, of Callywhite Lane, Dronfield, Sheffield, S18 6XR, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to tilting chairs of the type in which a resilient member or pad is sandwiched between the seat and the base of the chair, with a bolt fastening the resilient member between the seat and base and passing through a central hole in the resilient member. Such a resilient member is known which comprises a rubber bush about 4" in diameter and about 4" high and incorporating metal pins to prevent sideways tilting of the seat and to limit forward tilting, backward tilting of the seat being limited only by the degree of compression of the rubber. Thus the "tiltability" of the chair can be adjusted either by changing the overall dimensions of the bush (which is not compatible with maintaining a standard height of seat and standard length of bolt) or by changing the hardness of the rubber (which is most inconvenient in establishing mass production and identifying the characteristics of different bushes).

The primary object of the invention is to provide a resilient member for use in a tilting chair, the member being capable within standardised overall dimensions of being given any "tiltability" within a range. A secondary object is to provide a resilient member for use in a tilting chair without the need of metal pins to prevent sideways tilting. The invention also embraces an assembly of two plates for attachment to or incorporation in the seat and the base respectively of a tilting chair, a resilient member sandwiched between the plates, and a bolt, nut and resilient washer for securing the sandwich together, and also a tilting chair incorporating such an assembly.

According to the present invention, a resilient member for use between the seat and base of a tilting chair comprises a pad of resilient material with a central hole, a pair of projections from one face of the pad adjacent two opposite portions of the outer periphery of the pad positioned symmetrically relatively to the central hole, a pair of integral buffer portions along two marginal portions of the pad on the same face of the pad as the projections and extending parallel to the mid-plane through the central hole and the pair of projections, and an integral load-bearing portion also on the same face of the pad as the projections and positioned at least intermediate each buffer portion and the central hole, the buffer portions projecting to a lesser extent than the load-bearing portion and one buffer portion projecting to a lesser extent than the other buffer portion.

With the pad secured between two plates attached to or incorporated in the seat and the base respectively of a tilting chair, by a bolt passing through the central hole in the pad and a nut bearing on a resilient washer against one of the plates, the projections bear against one plate to prevent or severely restrict sideways tilting of the seat, while the greater and lesser buffer portions limit forward and backward tilting respectively of the seat by contact with the said plate, resilient resistance to which tilting is afforded by the load-bearing portion being compressed between the plates at the respective sides of the central hole in the pad.

The "tiltability" of a chair utilising a resilient member according to the invention depends upon the resilience of the material of which that member is made, but any desirable "tiltability" within a

[Price 25p]

range can be obtained by selecting appropriate dimensions for the load-bearing portion. The angles to which the chair can tilt forwardly and backwardly are governed by the extent to which the buffer portions project and their distances from the bolt-hole. In general, the rearward buffer will be the lesser one, so that rearward tilting is greater than forward tilting. In addition, (as their name suggests) the buffer portions act as resilient stops for forward and backward tilting.

The projections may be metal pins bonded into the pad and projecting to an extent corresponding closely to the extent to which the load-bearing portion projects. The free ends of the pins are preferably rounded, to promote a smooth rocking action of the seat on its base.

However, the projections are more conveniently formed as integral parts of the resilient member and project to such an extent as to be compressed when sandwiched between two plates for attachment to or incorporation in the seat and the base respectively of a tilting chair, the compression of the projections being such that the projections become substantially solid or rigid, i.e., they simulate metal pins. Thus the projections, being integral parts of the resilient member, may be formed initially projecting to a greater extent than the load-bearing portion, so that compression of the projections to the same level as the load-bearing portion will cause the projections to become substantially solid or rigid. Alternatively, the extent to which the projections project may be equal to or less than the extent to which the load-bearing portion projects, and the corresponding plate of a sandwich assembly may be provided with localised depressions to contact and compress the projections until they are substantially solid or rigid.

The pad may be square (or rectangular) with the projections in the middle of two opposite sides, and with the buffer portions provided along the other two sides; and the load-bearing portion may be formed by a rectangular raised portion extending both ways from the hole towards the buffer portions.

Preferably, however, the pad is circular and has the buffer portions bounded by portions of the circumference and chordal planes extending parallel to the mid-plane through the central hole and the projections; and the load-bearing portion is formed by an annular raised portion concentric with a circular central hole.

A suitable material for the resilient member is polyurethane, preferably formulated so as to give the requisite resilience (and substantial solidity or rigidity of the compressed projections) in an overall thickness of about $\frac{1}{4}$" and an overall diameter or greater width of 4".

In an assembly of resilient member sandwiched between upper and lower plates for attachment to or incorporation in the seat and base respectively of a tilting chair, with a bolt, nut and resilient washer for securing the sandwich together, the projections, buffer portions and load-bearing portion preferably project upwardly, the bolt being welded to (and preferably spigoted into a hole in) the lower plate, and the upper plate having a clearance hole around the bolt. The upper plate is preferably dished upwardly around the hole and the washer shaped on one face to seat on the upwardly dished part, so as to centralise the hole in the plate with respect to the bolt during assembly.

Other features of a preferred embodiment of resilient member according to the invention, an assembly incorporating it, and a number of modifications and alternatives, will now be described, by way of example only, with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of the preferred embodiment of resilient member according to the invention;

Figure 2 is an elevation in the direction of arrow A in Figure 1;

Figure 3 is a section from the line B-B of Figure 2;

Figure 4 is a section of the resilient member on the line C-C of Figure 3, incorporated in an assembly for a tilting chair, tilted backwards;

Figure 5 corresponds to Figure 4 but shows the effect of tilting forwards;

Figure 6 is a similar section, but corresponding to the line B-B of Figure 2 and showing a first modfication;

Figure 7 corresponds to Figure 6 but shows a second modification; and

Figure 8 is a plan of an alternative shape of resilient member.

In Figures 1 to 3, a resilient member 1 (e.g., of polyurethane) for use between the seat and base of a tilting chair (not shown) comprises a circular pad 2, with a circular central hole 3, two projections 4 diametrally opposed, a pair of buffer portions 5, 6 extending parallel to the diameter between the projections, and an annular load-bearing portion 7 concentric with the hole.

The projections 4 project to a greater extent than the load-bearing portion 7 so that when the resilient member 1 is sandwiched between two plates 8, 9 (Figures 4 and 5) for attachment to or incorporation in the seat and the base respectively of a tilting chair, the projections are compressed and become substantially solid or rigid, thus preventing sideways tilting of the seat.

The buffer portions 5, 6 however, project to a lesser extent than the load-bearing portion 7, so that backward and forward tilting can take place (as shown in Figures 4 and 5 respectively), rocking about the projections 4 and compressing the load-bearing portion 7 correspondingly, the buffer portion 5 projecting to a lesser extent than the buffer portion 6, so that forward rocking will not be as great as backward rocking. Because they are formed of the same material as the pad, the buffer portions 5, 6 (as their name suggests) act as resilient stops for backward and forward tilting.

The assembly of resilient member 1 and plates 8, 9 is secured together by a bolt 10, which is spigoted into and welded to the lower plate 9, a resilient washer 11 (e.g., of nylon) and a nut 12. The upper plate 8 has a clearance hole 13 for the bolt 10 and is dished upwardly around the hole, the washer 11 having a correspondingly shaped side, so as to centralise the hole 13 with respect to the bolt 10 during assembly.

In Figure 6, the projections 4, having been formed projecting to an extent equal to (or less than) the extent to which the load-bearing portion 7 projects, are compressed by localised depressions 14 in the upper plate 8, while in Figure 7 the projections 4 are formed by pins bonded into the pad 2 and provided with rounded upper ends 15 to promote a smooth rocking action of the seat on its base.

In Figure 8 the resilient member 1 comprises a square pad 2 with a circular central hole 3, projections 4 in the middle of two opposite sides 16 and with buffer portions 5, 6 provided along the other two sides 17, the load-bearing portion 7 being formed by a rectangular raised portion extending both ways from the hole 3 towards the buffer portions 5, 6, but this resilient member functions in precisely the same manner as does the circular one of Figures 1 to 3.

WHAT WE CLAIM IS:—

1. A resilient member for use between the seat and base of a tilting chair, the resilient member comprising a pad of resilient material with a central hole, a pair of projections from one face of the pad adjacent two opposite portions of the outer periphery of the pad positioned symmetrically relatively to the central hole, a pair of integral buffer portions along two marginal portions of the pad on the same face of the pad as the projections and extending parallel to the mid-plane through the central hole and the pair of projections, and an integral load-bearing portion also on the same face of the pad as the projections and positioned at least intermediate each buffer portion and the central hole, the buffer portions projecting to a lesser extent than the load-bearing portion and one buffer portion projecting to a lesser extent than the other buffer portion.

2. A resilient member as in Claim 1, wherein the projections are metal pins bonded into the pad and projecting to an extent corresponding closely to the extent to which the load-bearing portion projects.

3. A resilient member as in Claim 2, wherein the free ends of the pins are rounded.

4. A resilient member as in Claim 1, wherein the projections are formed as integral parts of the resilient member and project to such an extent as to be compressed when sandwiched between two plates for attachment to or incorporation in the seat and the base respectively of a tilting chair, the compression of the projections being such that the projections become substantially solid or rigid.

5. A resilient member as in Claim 4, wherein the projections are initially formed projecting to a greater extent than the load-bearing portion.

6. A resilient member as in any one of the preceding Claims, wherein the pad is square with the projections in the middle of two opposite sides, and with the buffer portions provided along the other two sides.

7. A resilient member as in Claim 6, wherein the load-bearing portion is formed by a rectangular raised portion extending both ways from the hole towards the buffer portions.

8. A resilient member as in any one of Claims 1 to 5, wherein the pad is circular and has the buffer portions bounded by portions of the circumference and chordal planes extending parallel to the mid-plane through the central hole and the projections.

9. A resilient member as in Claim 8, wherein the load-bearing portion is formed by an annular raised portion concentric with a circular central hole.

10. A resilient member as in any one of the preceding Claims and formed of polyurethane.

11. An assembly of upper and lower plates for attachment to or incorporation in the seat and the base respectively of a tilting chair, a resilient member as in any one of the preceding Claims sandwiched between the plates, and a bolt, nut and resilient washer for securing the sandwich together.

12. An assembly as in Claim 11, with a resilient member as in Claim 4, wherein the extent to which of the projections project is equal to or less than the extent to which the load-bearing portion projects and the corresponding plate of the assembly is provided with localised depressions to

contact and compress the projections until they are substantially solid or rigid.

13. An assembly as in Claim 11 or Claim 12, wherein the projections, buffer portions and load-bearing portion project upwardly, and the upper plate has a clearance hole around the bolt.

14. An assembly as in Claim 13, wherein the upper plate is dished upwardly around the hole and the washer shaped on one face to seat on the upwardly dished part, so as to centralise the hole in the plate with respect to the bolt during assembly.

15. A resilient member for use in a tilting chair, the resilient member being substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings or as modified in Figure 6 or in Figure 7 of the accompanying drawings or substantially as hereinbefore described with reference to Figure 8 of the accompanying drawings.

16. An assembly consisting of a resilient member sandwiched between two plates for attachment to or incorporation in the seat and base respectively of a tilting chair, with a bolt, nut and resilient washer for securing the sandwich together substantially as hereinbefore described with reference to Figures 4 and 5, Figure 6 or Figure 7 of the accompanying drawings.

17. A tilting chair incorporating a resilient member, or incorporating an assembly consisting of a resilient member sandwiched between two plates for attachment to or incorporation in the seat and base respectively of a tilting chair, with a bolt, nut and resilient washer for securing the sandwich together, as in any one of the preceding Claims.

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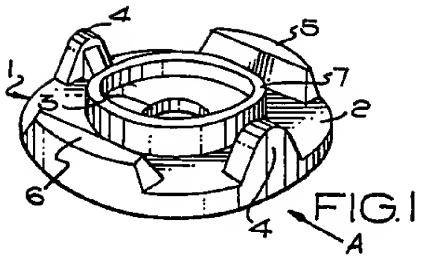

FIG.1

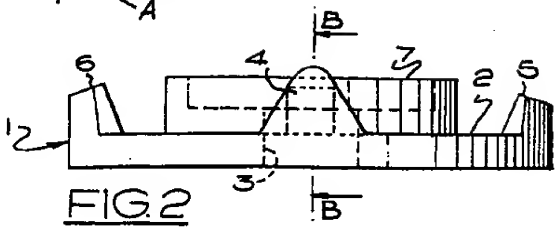

FIG.2

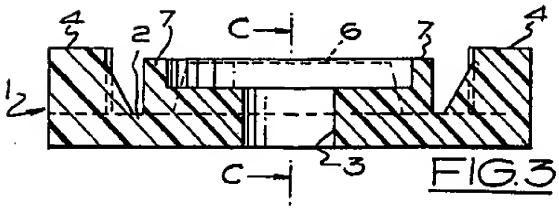

FIG.3

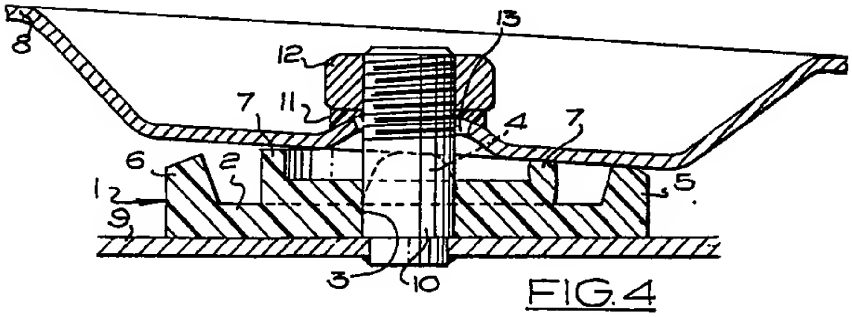

FIG.4

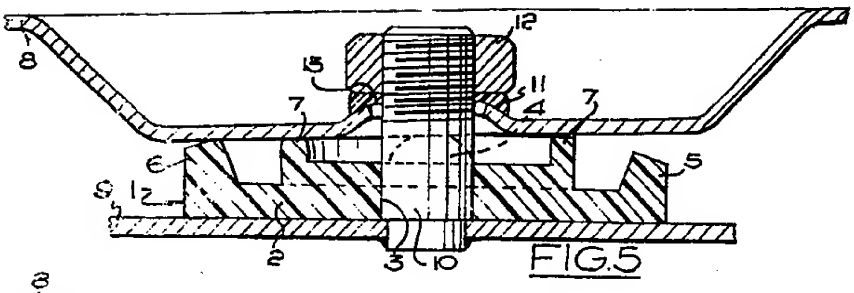

FIG.5

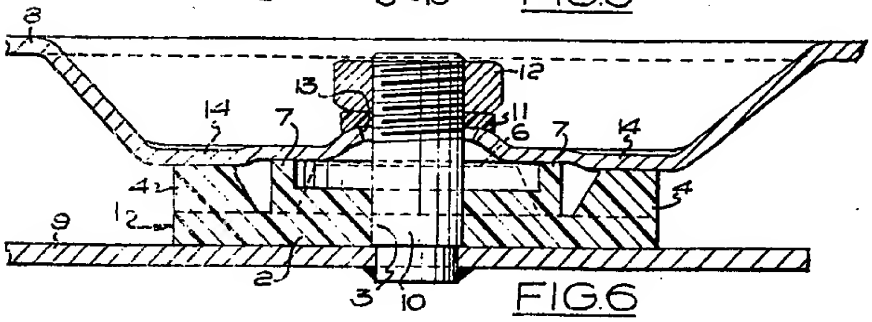

FIG.6

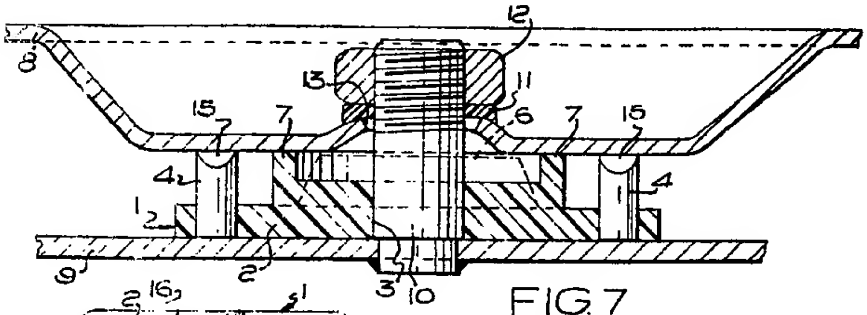

FIG.7

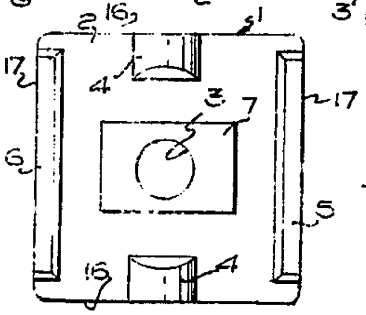

FIG.8